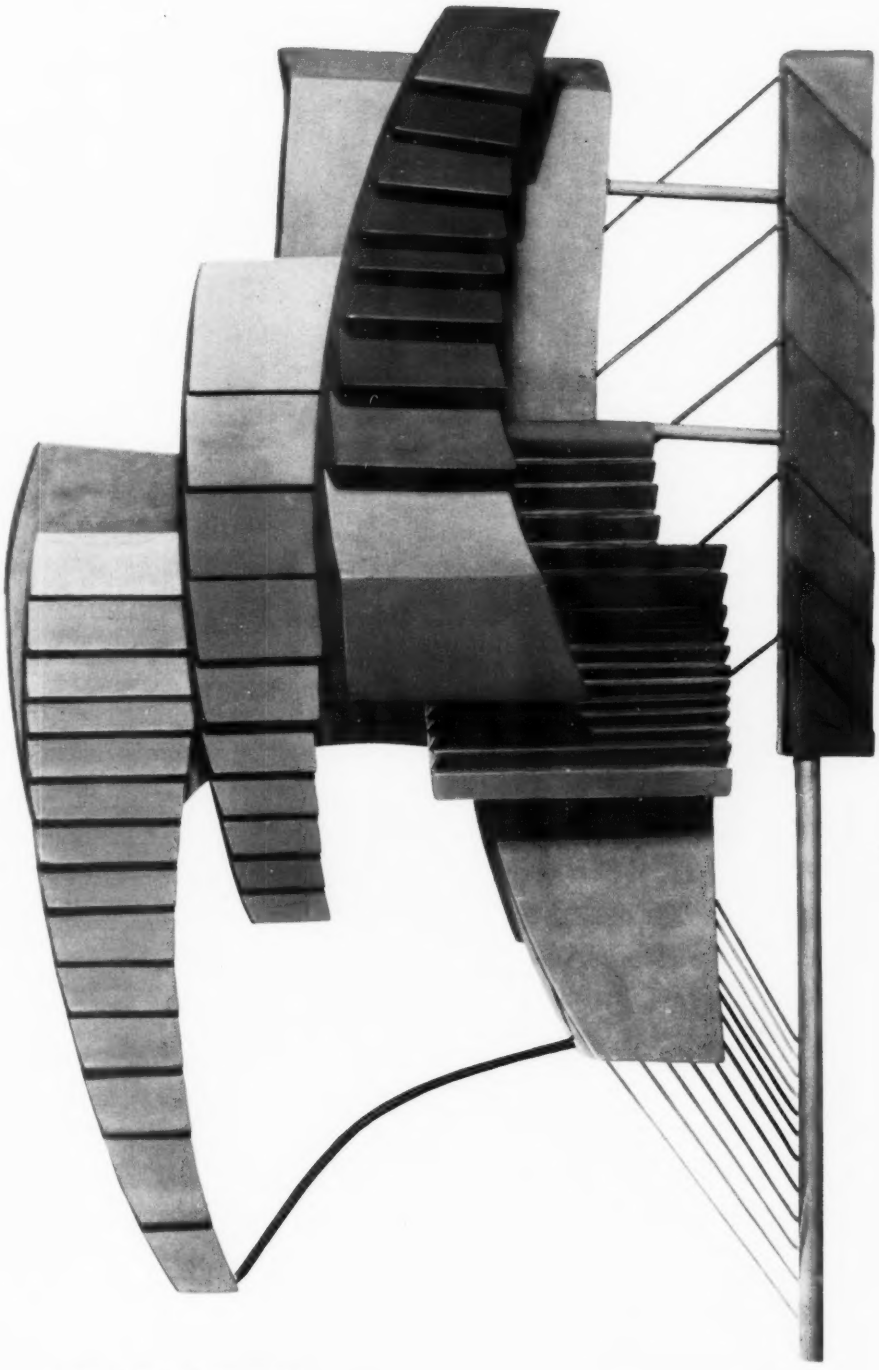
MAIN CURRENTS

IN MODERN THOUGHT



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MAIN CURRENTS IN MODERN THOUGHT

A co-operative journal to promote the free association of those working toward the integration of all knowledge through the study of the whole of things, Nature, Man, and Society, assuming the universe to be one, dependable, intelligible, harmonious.

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CONTENTS

The Mechanism of Consciousness	B. K. Bagchi	75
A Neurologist's Excursion into Psychology	C. Judson Herrick	82
Structuralism	Hilaire Hiler	86
The Relation of Christianity to the non-Christian Religions		87
News and Notes		89
Source Readings: Integrative Materials and Methods		
Consciousness is Reintroduced into Psychology		90
The Problem of Evolution: Origin of the Human Brain		91
The Integration of Science into Culture		92
Magnetohydrodynamics		94
Reviews		94

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THE MECHANISM OF CONSCIOUSNESS

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Consciousness, its Aberrations, and the Electrical Rhythm of the Brain

I

IN his book *The Mind and its Place in Nature,* Broad remarks, while discussing existents and abstracta: "I do not think that existence can be defined but it can be unambiguously described." (7)* This remark I believe applies also to consciousness.

Consciousness can be described but it cannot be truly defined or explained. Of necessity and not as a final commitment, we shall use the terms consciousness and mind interchangeably in this paper. If by definition of consciousness is meant the enumeration of its processes or elaboration of the extent of conscious activity we can define consciousness. But this is really a description of consciousness. If, on the other hand, by definition of consciousness is meant a statement of its significance, an explanation of its origin or nature, referring the fact of consciousness to a broader fact or principle, and that to a still broader fact or principle, then consciousness cannot be adequately defined. The reason is twofold. Consciousness is a primary datum, a fundamental premise, assumed in all acts of explanation or definition of itself and its processes. There would be a circular process if the explainer explained itself by itself. Secondly, consciousness cannot refer itself to a larger fact or principle or existent which may give it significance or origin, without first assuming the ability of its own instrument or powers to build concepts about such larger fact or principle or existent. But this assumption may be challenged. It may be held that consciousness is unable to go beyond its own inherent boundaries. However, once consciousness is assumed as a premise, as a primary datum, and belief in its capacity is assumed, then we can begin to explain consciousness, matter, events, world, God, good or ill, by using data of consciousness—sense data, perceptual data and ratiocinative data—and by relating one to another. But it may be easily forgotten that consciousness cannot "jump out of its own skin" and cognize and understand what is beyond its skin unless a second asumption is made—which idealists and some neo-realists do make—that what may be beyond its skin, that is, the reality, is somehow connected with consciousness or concurrently active with it. (14, 24)

This doubt is not new, even admitting that there is a lurking dualism in the doubt itself. The Vedantist Shankaracharya in the 7th century, following some tendency in the 3,000 year old Upanishads of India, and Kant, the German, in the 18th century, described the limitations of the powers of knowing. Kant's antinomies of reason and Shankara's *aparavidya* are well known. (16,20,22) On the other hand there are thinkers who hold a different view. To them the sphere of consciousness can be extended to the entire universe. The epistemological difficulty of such thinking is not serious, it is contended. In 1943 Boodin wrote an important article on *Cosmic Attributes* (10) in which he considered space, time, form and pluralism as attributes of reality, and tried to view them in terms of modern scientific concepts. First, as to space, Boodin distinguishes ordinary metric space and time from true space and time. Space cannot be a fiction of mathematicians, he says, for it is required as a medium in order to describe the physical world and intersubjective relations. With regard to the second attribute, time, its cosmological basis is suggested by entropy. Boodin proposes that the factor of Lambda in the Theory of Relativity, which Eddington calls the cosmological constant, is the entropy or source of a force of dispersion in our brains and in the abysses of stellar space. Entropy implies that the universe is running down and this concept *itself* would suggest a cosmological basis of time. The third attribute is form. The cosmos is form or is structured. "It is not static but dynamic. That structure is a cosmic whole-structure as indicated by the measured pulses or rhythm of nature and the repetition of patterns through nature," e.g. temperature fluctuations, quanta of matter dissolving into radiation and vice versa, atomic number scale in physics, and field of organization in embryo and nervous system in biology. All these point "to cosmic rhythm and repetitive pattern, in other

*Numeral references are to works listed in the bibliography at the end of the paper.

words, dynamic structure." Fourth, there is plurality. Plurality of nature includes entities and fields—gravitational fields, electromagnetic fields, etc.—and material entities and psychological entities. ". . . One aspect of plural entities is consciousness, awareness. Our central field of awareness in connection with the cortex is a fusion of a hierarchy of fields of awareness in connection with the lower levels in the cortex, in the ganglia, in the cells, without abrogating those various awarenesses which our introspection cannot reach. If there is a universal sensorium, this would be a field, fusing into itself all the lower levels of awareness including the inorganic world though these awarenesses still persist in their particular contexts."

This description is an important illustration of the contemporary effort to find support from speculations on modern science for a mixture of idealism and realism. If the utter competence of consciousness and thought were assumed, this account would stand as a monument to new realism. But as mentioned before, some would doubt the competence of consciousness to reconstruct reality. They do not *deny* reality—they are not representationists like Locke or subjective idealists like Berkeley—but they assert that reality can *only* appear within the limited frame of reference of consciousness, individual or collective. And this in spite of the belief of some neo-realists that a "theory of reality can be formulated from certain fundamental logico-mathematical concepts" which seem to have some "non-mental" neutral character. (24) So according to the doubters, the validity of what reality, consciousness or mind reconstructs is the validity of common consistency, of common human concurrence, and of common action and prediction. But this validity may not be the validity of objectivity. Thus consciousness faces the perpetual conflict between its seeming ability progressively to understand the world and to change this world in part, and its inability to understand why it cannot understand or change more than a part. There is also the basic dilemma that metaphysically or epistemologically consciousness *cannot prove without assuming part of what it wants to prove.* Even if we could discard the necessity of obtaining extra-conscious proof and only accept the validity of intuition of reality, we still would be in the predicament of facing a thousand and one versions of the intuition of that reality and not know which is the valid version.

II

WHAT follows is a description of consciousness, not a definition of it, and some notions about its aberrations and its connection with the body, especially the brain. Before the days of Pythagoras, Plato and Socrates there were many attempts in India to understand consciousness from a philosophic and psychological standpoint. To begin with a later age, the materialistic and hedonistic philosophy of India, that of Charvaka, which is so little mentioned in the Occident, maintains that consciousness is a product of the body and perishes with the body. There is no heaven or hell or rebirth. (5,12,22) Consciousness is an epiphenomenon, as 19th century Western materialism called it later. Buddhists stressed the stream of consciousness which is subject to rebirth. They ignored the concept of the soul. They did not consider the soul to be the origin of consciousness, or the vehicle that works out *Karma* (the law of cause and effect as it operates for human beings) eschatologically in repeated rebirths. But they have not adequately answered the question how the stream or flux which consciousness is, according to the Buddhists, can maintain a relatively enough stable vortex of individuation or continuity through the death of one body and birth of another in order to work out in the latter body the *Karma* acquired in the former. Believers in soul may get around this difficulty by postulating the soul as a mechanism of continuity through rebirths, but if one accepts the Buddhist position one wonders how seeds of *Karma* or rebirth can inhere in the flux of consciousness, which itself is not permanent, to cause rebirths?

Going to an earlier period, *chit* or consciousness is assigned to reality, in the non-dualistic Vedantic interpretation of Upanishads. According to superior perspective, *paravidya,* true reality, is unknown, indescribable; it is expressed only negatively as "not this, not this." True self is neither the subject nor the object. There is no creation. But according to lower knowledge or perspective, *aparavidya,* there is cyclic evolution and involution. We are told again that reality or Brahma is not only *chit,* consciousness, but also *sat* and *ananda,* i.e. existence and bliss. Certainly these words, existence, consciousness and bliss, are used by the Vedanta philosophers as expressions for reality in a connotation that is entirely different from the ordinary. If they did not, these words would imply, by contrast, non-existence, unconsciousness and sorrow, concepts which would oppose and limit reality, and this would certainly be contradictory to their philosophy. Sankhya-Yoga philosophy clearly distinguishes between changeless, eternal, transcendental, inactive self, or pure consciousness, and the ego-principle or *ahamkara.* The first progeny of the so-called union of self and inert, unintelligent *prakriti* or primordial matter is *mahat* (literally, the great, universal mind being implied). From *mahat* arises *ahamkara,* the ego-principle, and from this, in turn, what may be called determinate consciousness or mind, also the senses, and subtle and gross elements.

Nyaya-Vaishesika philosophy, with its logical realism, treats consciousness as derived property of the soul, which is independent and immaterial substance. The Mimamsa phiosophers take essentially the same position. In some Indian philosophies, such as the Sankhya, the mind-matter problem does not exist in exactly the same sense as it does in Western philoso-

phies. This point has not been sufficiently stressed by Western writers who discuss Indian philosophy. Mind or consciousness is not exactly opposed to matter. Rather, mind is a product, a point in the evolutionary process, the concretized terminus of which is what is known as gross matter. Mind *is* a form of matter. (8,12) In other words, mind and matter taken in the ordinary sense occupy different points on a spectrum that originally stemmed, whatever the mechanism, from that unknown principle, the intangible, the inexpressible, the transcendental soul, taken either in the sense of the idealistic pluralism of Sankhya-Yoga (recalling Leibnitzian monadism) or the absolutistic monism of the Adwaita Vedanta in its empirical perspective (recalling Platonic or Bradleyan transcendentalism).

Another important point in this evolutionary spectrum is *prana. Prana* is poorly translated as vital breath, better translated as energy. This *prana* or energy is the subtle essence (*tanmatra*) of perceived matter; it is a product yet at the same time the energy-vehicle of what is commonly known as mind. (12) This energy or *prana* can also be conceived as the life principle, and may be thought to underlie all matter, including living matter and the brain. The brain is termed symbolically by some Indian philosophers (Yogis) as a thousand petalled lotus, *Sahasrara,* a thousand energy-loops. According to them there is also *spandan* (vibration or wave phenomenon) in the universe. *Prana* or energy, *spandan* or vibration or wave phenomenon are related, but how they are related has not been explained by the Indians. Is wave phenomenon inherent in matter? Is wave phenomenon inherent or detectable in the brain? The first question has been dealt with in modern physics. The second question will be discussed shortly.

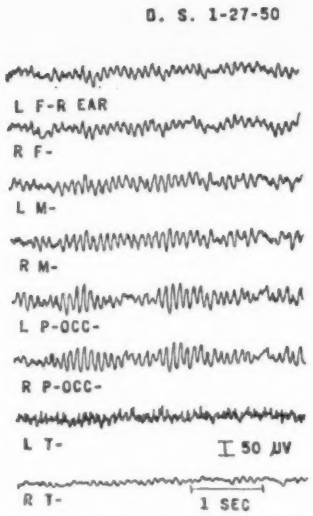
Concurrently, another question arises: According to modern science, where is the place of consciousness or mind in the cosmos or in the brain? In spite of Jeans' suggestion about the mathematical structure of reality principle, and of Eddington's description of physics' pointer-readings of the shadow-world of invisible energy transformed, as it were, by consciousness into our three-dimensional perceived world of solid matter in the fourth dimension of time; in spite of the fact that Heisenberg's principle of indeterminacy has made it easy for some believers to accept the postulate of freedom of will, science has not yet positioned consciousness. Probably it is not supposed to do so, although it has made more idealistic maneuvers in that direction than its 19th century exponents would have liked. Consciousness is still an accident in the physicist's universe, though a necessary accident, a very central phenomenon. Because without symbolic abstraction of thought and consciousness, the so-called new physics cannot be presented or understood even in a structured pattern of inner consistency. This is apart from the important question of moral or ethical values which consciousness can present.

III

NEUROPHYSIOLOGY has also sparked speculation about consciousness. (1,15,26,22) Boring, the Harvard psychologist, suggests, "Consciousness exists as relations and exists only in the sense that relations exist." (11) Relations between what? Relations between neural events in the central nervous system where selection, learning and discrimination are known to occur. This view of consciousness has some resemblance to the view of some neo-realists with whom "consciousness becomes a portion or cross-section of the environment responded to by the nervous system." (25) While this description of consciousness by Boring is vague, the events of the brain and nervous system which underlie consciousness are not all vague. They have become known as a result of extensive neurophysiological and anatomical researches. It is known that there are spatial punctate projections of retinal area and skin area to visual and somesthetic areas in the brain. It is also known that the intensity of sensation as perceived in consciousness varies with the number of electrical or nerve impulses per second that travel over the nerve fibers from the periphery, and with the degree of recruitment of fiber discharges until they arrive at the brain. And yet we must state that the brain does *not* respond to these incoming impulses pointwise but only patternwise. According to Adrian, "The uniqueness of each percept is attributable to specific spatio-temporal pattern of neuronal activity in the cortex." (1) Eccles goes beyond this and says, "In general, it may be postulated that any thought pattern in the mind has a counterpart in a specific spatio-temporal pattern of neuronal activity." (27)

The brain is not simply a telephone switchboard, not just an intermediary between incoming and outgoing signals. In it there is intense activity in the form of synchronization and asynchronization of nerve impulses, there is reception, storing, collation, and directioning of neural messages, there is inter-cellular and thalamo-cortical reverberation of impulses, there is apparently scanning in the brain as in TV, there is vortex formation and vortex dissipation. Some of these ideas are based on experimental facts, others are speculative. Above and beyond exposing itself to constant electrical bombardment from the periphery, ten billion nerve cells of the brain have spontaneous electrical activity of their own, activity depending upon metabolism. Stop circulation, metabolism, enzymic activity, and the electrical activity of the brain stops. Consciousness stops with them too. The brain wave is flat ten or fifteen seconds after the heart stops. In small hibernating animals, when metabolism and heart action are at the lowest point brain waves are much depressed, but not absent as in death nor as active as in ordinary sleep.

The electrical activity of the human brain was not known until 1929, when a German doctor, Berger, first reported it. Since then voluminous material has been accumulated on the subject. This electrical activity and consciousness are related. And yet except



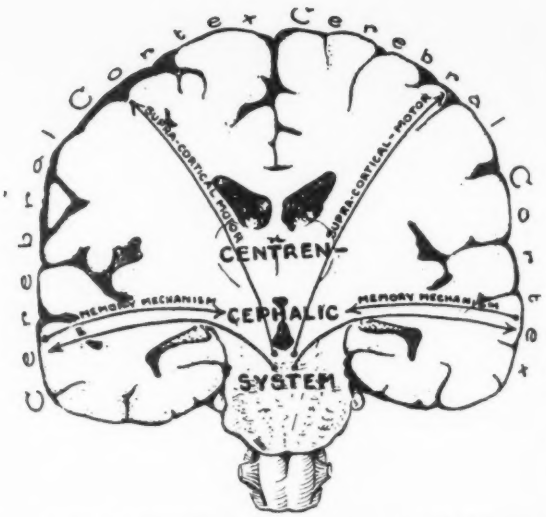


Fig. 1. Subject alert: normal electrical pulsation of the brain due to the integrated electrical activity of the upper part of the brain, modulated and controlled by pacemakers in the deep centrencephalon. Frequency of pulsation is about 10 to 11 beats per second, called alphas, with a voltage which may vary normally without giving any clue to the function of the mind. Thinking of a ball game or solving a mathematical equation may have about the same rhythm. LF equals frontal, RF equals right frontal, LM equals left motor, RM equals right motor, LPocc equals left parietoccipital, RPocc equals right parietoccipital. Reference lead is on right ear. Voltage calibration equals right line representing 50 millionths of a volt. Time calibration equals horizontal line, one second.

Fig. 2 Centrencephalon. The centrencephalic system may be defined as that neurone system, centering in the higher brain stem, which has been up to the present, or may be in the future, shown to have equal functioning relationships with the two cerebral hemispheres. It forms the chief central integrating mechanism for various areas of cortex. The to-and-from projection pathways indicated should be considered as integral parts of this system. "Supra-cortical motor" pathway carries the impulses to precentral gyrus that results in voluntary movement. "Memory mechanism" pathways render the records of past experience available. From Penfield's **Epilepsy and the Functional Anatomy of the Brain,** Little, Brown & Co.

for some general correlation between the two, specific components of the relationship are non-existent or are unknown, although areas of the brain where this relationship may be intimate are suggested. The concept of dualism or psychophysical parallelism is now giving place to the concept of a total organismic function. Here neo-realism is probably on the right track. Descartes' idea of the pineal gland as being the seat of interaction between mind and brain was discarded long ago. Descartes' notion of animal spirits passing through hollow nerve fibers has been supplanted by the modern concept of nerves as core-conductors over and through which nerve impulses pass. Aristotle's notion of the heart being the seat of consciousness is no longer true, although indirctly the heart, as mentioned before, is known to have much to do with keeping the brain metabolically and electrically alive for consciousness. (Fig. 1 illustrates normal brain waves.)

IV

LOCALIZATION of cerebral functions and localization of consciousness in the brain are interrelated problems. With the progress from adaptive functions of simple animals like worms to highly abstract and thinking processes of men, there has been progressive enlargement, differentiation and complexity of the morphological and physiological organization of the brain. There has also been some change, though not proportional, in its demonstrable electrical behavior. It used to be thought that consciousness was solely connected with the upper layer, mantle or cortex of the brain. Modern clinical and neurophysiological researches suggest that this is not entirely true. Rather, deeper levels of the brain are tied up with consciousness, or at least semi-determinate awareness, even though elaborate interpretation of peripheral messages and the complexity of mental behavior and abstract thought depend in a large measure upon the integrity of the upper layer, the gray matter. And yet when you ask a neuropathologist he will tell you that microscopically or macroscopically there is *no* detectable difference between the brain of an average man and that of a genius. What makes the difference then? The electrical rhythm? So far this has not been proved to be true.

Another line of evidence from animal experiments as to the importance of deeper integrative structure has been furnished by some investigators, (15,24) who showed that reticular formation of the deep lying structures like medial thalamus and brain stem core have influence on the electrical activity not simply of one part but of the entire brain. Clinical cases furnish further evidence. Aberrations of conscious-

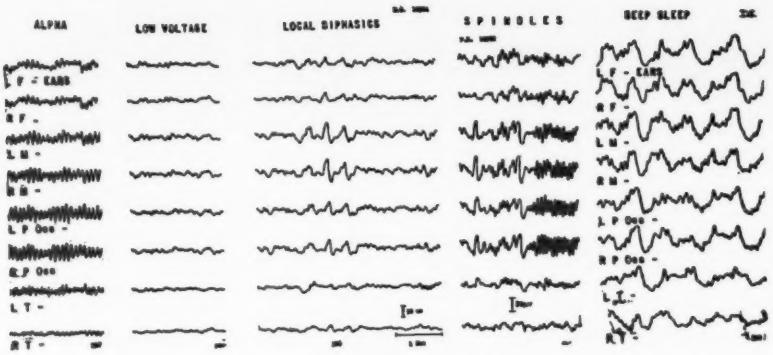


Fig. 3 Progressive diminution of consciousness. 1st column to left: brain waves indicate the normal person is relaxed, alert and aware of himself and surroundings. 2d column: he is getting drowsy. 3d column: he is in light sleep and certain "deeper centers" are more active, indicated by special spiky projected discharges. 4th column: his sensibility is temporarily lost and he may be breathing hard. 5th column: he is in dreamless deep sleep and his brain shows an entirely different type of activity. There is much fluctuation between these four stages. These changes in rhythm, supposedly controlled by deep "sleep" or "waking" center, are the only dramatic and direct evidences science has regarding what happens inside the brain in sleep. What do they mean? We do not get these changes in hypnotic sleep, when the brain waves are like those in waking.

ness, such as momentary lowering of consciousness, coma, unconsciousness as found in convulsive disorder or other cases, are associated with the most pronounced electrical disturbance in the brain in the form of increased voltage and slower wave-length. This clinical and electrical disturbance is not basically due to the disturbance of the upper part of the brain, the cortex. This may be entirely due to the disturbance of the deeper level or what has been called by Penfield of Montreal, who is one of the greatest living brain surgeons, *centrencephalic structure,* i.e. the upper brain stem and diencephalon (thalmus and hypothalamus). (Fig. 2) This structure is centrally and deeply located and functionally related equally to the two upper hemispheres of the brain. (15)

Natural sleep (Fig. 3) is known as not primarily due to the action of the upper layer of the brain but evidently to the switching off of the "waking center" in the deep "centrencephalon." Unnatural somnolence is sometimes due to tumor or ablation of posterior hypothalamus that is included in the centrencephalon. (24) Dandy's (4) patient in 1928 supplied a negative evidence. This patient had operative loss of the *entire right hemisphere* but he lived and functioned without mental impairment. So consciousness cannot have its seat in the right hemisphere.

There are two interesting clinical conditions called petit-mal and psychomotor seizure. (Fig 4) During psychomotor seizure the patient who is other-

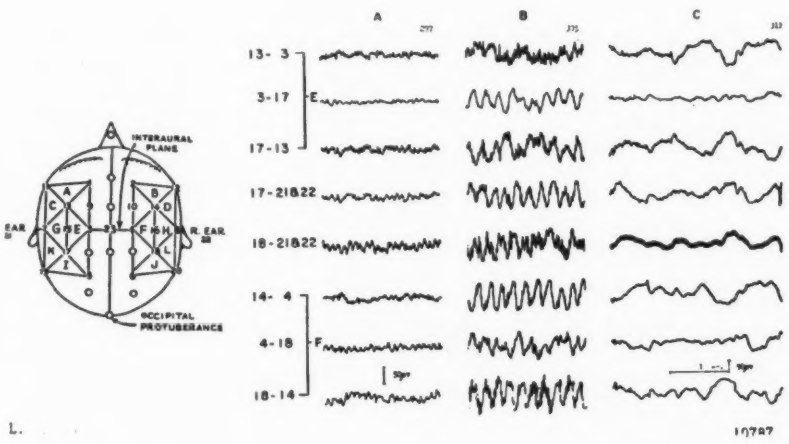


Fig. 4. Psychomotor seizure. Column A: normal brain activity: Column B: increased synchronization and slow activity. 45 seconds before, the seizure began and lasted 200 seconds, during which patient was confused, restless and unresponsive. Column C: disappearing phase of spell, brain showing profound slow wave disturbance indicating cerebral pre-exhaustion state.

wise well is thoroughly confused and yet performs some integrated motor activity, such as fumbling with things, talking incoherently, walking for miles, etc., with *complete* loss of memory for everything done or said during the attack. The episode may last from seconds to hours. This condition is found to be due to the *electrical explosion* of an abnormal area usually in the deep temporal area, lateral aspect of the upper brain, which is indirectly tied up with the centrencephalon. In Penfield's and Bailey's Institutes and our Hospital these abnormal temporal areas of the brain have been dissected in dozens of patients with resultant improvement in behavior, and in about one third of the cases, complete disappearance of episodes of aberrations of consciousness and confusional activity which previously made theirs and others' lives miserable and hazardous. This suggests that aberrations of consciousness and behavior may be caused by aberrations of the temporal lobe.

Penfield* and others have also shown repeatedly in *conscious* patients in the operating room that electrical stimulation of their abnormal temporal lobe causes the patients to report verbally most vivid visual, auditory or complex familiar memory images of the past. They could see people walking, hear beautiful music, recall most intimate experiences under temporal lobe stimulation. This memory arousal does *not* occur with the stimulation of other areas of the brain. Do all these findings suggest that the temporal lobe is the seat of consciousness or memory? According to Penfield, "the area essential to the existence of conscious activity is the centrecephalon," (28) and memory images that are aroused by stimulation of the abnormally sensitized temporal lobe in such cases result in part from the activation of the temporal subdivision of the deep centrecephalic system. (15) Lower animals with undeveloped mental life have undeveloped upper cortex, but they invariably have proportionately developed old brain or centrencephalon. Modifying Stanley Cobb's statement, we may say that the switch box of consciousness is in the basement (deeper levels of the brain), although its illumination lies in the upper story (gray matter in the cortical mantle).

The view that there is a center of consciousness is not, however, shared by other investigators, chief among whom is Lashley, well-known neuropsychologist of Harvard. He rejects "any concept of a center of consciousness as a limited center where information is accumulated, for the complexity of mental process is far too great to be represented by the permutations of a small number of brain cells. Such a center may act as a pace-maker but not as an organizer or terminal receiver." (2) According to him, in striving to understand conscious behavior we should think not of a single center but rather of a "vast reverberatory system in the brain," with "functional rather than structural patterning." (27, 29) In explaining Lashley's concept, Eccles says, "memory of any particular event is dependent on a specific organization of neuronal associations (the engram) in a vast system of neurons widely spread over the cerebral cortex . . . Any particular memory trace or engram has multiple representation in the cortex and each neuron and even each synaptic junction are built into many engrams." (27, 29)

Whatever the fate of this engram hypothesis, it certainly is different from the exclusively anatomical approach to the study of the brain and mind. This electrical study leads to an extension of the electrical concept of matter to mind. And this is exactly what some neurophysiological workers are attempting to do. Still there would remain, I am afraid, a gap between electrical phenomena and consciousness, unless some miraculous mutation is discovered to bridge the gap. One may speculate that consciousness and *prana* and its analogue, electrical phenomena, form a complex dynamic matrix included in the universal field of reality, which is called nature, spirit, God, or what you will. Scientists, when they are not in their philosophical mood, may stand mute or shy away from such speculation.

V

WIENER, McCulloch and Rosenbleuth, in trying to understand behavior, brain activity, and consicousness, apply the knowledge of cybernetics, or the science of control and communication to this field. (39) One of the fundamental principles of cybernetics is the feed-back principle. The negative-feed back system as used in servo-mechanisms, such as the thermostatic action of furnace heating, or the governor in an engine, may be utilized, they contend, in understanding neural activity. All purposeful behavior, according to the authors, may be considered to require negative feed-back. "When the signals from the goal are used to restrict outputs which would otherwise go beyond the goal, we have the negative feed-back system operating . . . When the feed-back is undamped the whole system goes into uncontrolled oscillation, like the cerebellar patient showing oscillatory tremor of his hand when carrying a glass of water from a table to his mouth, thus spilling the water and missing the goal." (9) Negative feed-back is a teleological system, and yet it is thoroughly deterministic, but different from one-way irreversible process of causality.

The authors picture the million or so networks of the brain operating as a most elaborate and intricate electrical feed-back system where storage, delay function, tripping, modulation, intensity, and phase are other interrelated parameters. This system may work in perception, emotion, intellection and behavior. How we know universals, how we recognize shapes irrespective of sizes, and classes irrespective of individuals, may be evaluated, according to the authors, in terms

*See Penfield's article, *On the Functional Organization of the Human Brain*, MAIN CURRENTS, Vol. 11, No. 2, November 1954, pp. 27-30.

of controlled electrical patterning of neural activity. Also the authors introduce to neurophysiology the concept of scanning mechanism—the mechanism by which signals are scanned for transmission in TV. Walter associates scanning in the association areas of the brain with the alpha rhythm.

Although we are very far from understanding consciousness and mind in electrical and neurophysiological terms which have to do not only with quantity and mass but with energy levels, the interdisciplinary approach—mathematics, electronics, electroencephalography, biology, biochemistry, psychology, philosophy working together—promises to be more productive in this connection than mere data-gathering and speculation within one particular field. Let us hope that in the not-too-distant future more integrated knowledge about the less accessible aspects of man will be made available, to shed new light on the relationship between man and the universe of which he is a small but intrinsic part.

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A NEUROLOGIST'S EXCURSION INTO PSYCHOLOGY*

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The Mind as Function

The Basic Problem

WE are told by an eminent clinical neurologist[1] that the human brain is the most important thing in the world, for human history is a history of the brain activity of the human race. This activity is expressed in two quite different ways—as overt behavior of a physical body in transactional relations with the physical world, and as conscious experience. From the beginning of the record the cardinal problem of both science and philosophy has been the exact nature of the relationship between the physical world and the mental processes of the experiencing subject.

From the standpoint of natural science three directions of approach to this problem merit consideration. The solutions proposed by those philosophers who base their arguments on metaphysical postulates have resulted only in dissention, because they have not been able to agree about the appropriate postulates. The attempts of neurologists to describe a physical mechanism of conscious experience have not yet succeeded. The psychologists have fared no better. The discordant schools of thought have not been able to reach a consensus about what the mind is or how to find this out.

The interested spectator who sits on the fence watching the contest last mentioned sees two opposing teams and, on the side lines, a goodly number of other psychologists who do not join either faction. In one team the partisans of traditional dualism contend for a sharp separation of the conscious, or "spiritual," activities from the unconscious, or "physical," thus splitting the world as we experience it into two universes, one of which has been characterized as "spiritual reality" or "ideational reality" and the other as "physical reality." Opposed to the radical spiritists are the mechanists, who insist that, since the search in both science and philosophy is for unifying principles, and since it has not been possible to explain how a nonphysical agency can act upon a physical structure so as to influence human conduct, we must search for physicalistic principles of sufficiently wide import to embrace all the known phenomena.

My purpose here is to examine, from the standpoint of mechanistic biology, some of the diverse fields of inquiry which must be integrated before this basic problem can be formulated in accordance with physical, physiological, and psychological principles now generally accepted. The divisive tendencies of current scientific movements are retarding progress.

The key factor in the current controversy about the nonphysical nature of the human spirit really hinges on a definition: Just what do we mean by physical structure and what are its properties? We must define the physical before we can talk rationally about the nonphysical. A brief summary of a few principles of current physical science is prerequisite to further consideration of the meaning of the word "physical" in biological and psychological contexts.

Physical Science of Today

THE history of ideas about the nature of the physical world records three revolutionary periods. The Greek period, typified by Aristotle and Euclid, dominated formal thinking for two thousand years and is still influential. Beginning in the middle ages a second revolutionary period culminated with the Newtonian system of mechanics. The third period began with the twentieth century, as exemplified in relativity and quantum mechanics. It is still in its infancy and its findings are more revolutionary than any of the preceding.

The fundamental conceptions of physics are in flux. New methods have revealed new facts which require new principles, and some principles formerly regarded as axiomatic are now suspect. The absolutes of earlier times are now treated relativistically, with radical reorganization of the science of mechanics.

To put it briefly, natural science today regards our cosmos as a stupendous mechanism (physicalism) composed of innumerable subsidiary mechanisms, all bound together in accordance with lawfully ordered principles. We do not adequately understand any thing or any event until we know the mechanism that produces it and the principles in accordance with which it operates. A mechanism is defined by D'Arcy Thompson[1] as ". . . whatsoever checks or controls, and guides into determinate paths, the workings of

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*By permission of the American Psychological Association, this essay is reprinted, with some condensation and alteration, from the author's paper, "Psychology from a Biologist's Point of View," *Psychol. Review*, 1955, 62, 333-340.

[1]Gibbs, F. A., "The Most Important Thing," *American Journal of Public Health*, 1951, 41, 1503-1508.

[1]Thompson, D. W., *On Growth and Form*, Macmillan, N. Y. 1942, p. 291.

energy." Accepting this definition, the science of mechanics deals with energy and the "whatsoever" that controls its workings.

The mechanism makes some specific kind of product and the nature of the product is the crucial issue in its organization. This product may be material arranged in a different way or place, or energy in a different pattern of manifestation. Or it may be matter transformed into energy or energy into matter, for these are known to be interconvertible in quantitatively measurable relations (Einstein's conversion equation, $E = Mc^2$). In view of this last point the distinction between matter and energy becomes rather fuzzy, and any manifestation of an energy change is a physical event.

The belief now current among physicists is that the various kinds of atoms are relatively stable and different patterns of energy. There are no different kinds of energy. The so-called thermal, electrical, and other energies are different patterns of manifestation of one common measurable quantity which in our ignorance we call energy. Nature as a whole is process. There is nothing static about it anywhere.

In a natural mechanism the materials and energies used may come from a wide field and the product made is in turn delivered to the surroundings. It follows that the active structure, the machine itself, must be so defined as to include the entire field with which it has transactional relations. The mistaken popular notion that a machine is a passive inert structure operated by an outside agent is derived from the artificial machine with a human operator. It is true that a lathe in a machine shop has no value as mechanism without the operator who starts it, stops it, and controls its action. This means that, from the operational standpoint, the operator must be regarded as an integral part of the mechanism. In natural mechanisms it is more evident that the operator is inside the apparatus. The apparatus itself is the operator; that is to say, the machine operates itself. No natural mechanism needs a djinn or any external operator to run it or tell it what to do. This, we believe, is as true of a man as of a solar system or a volcano.

Classical physics as formulated in Newtonian mechanics deals with inert solid particles of matter which differ in mass and are pushed about by forces acting upon them. These forces are considered to be manifestations of energy, and the movements are measurable in arbitrary units of space and time. Twentieth century science, on the contrary, finds that matter and energy are different manifestations of the same unknown something and that in some domains of physics space and time in the objective world must be treated relativistically with reference to each other. In subatomic physics they cannot be measured in arbitrary units, with the observer as a fixed point of reference.

A physical mechanism is defined dynamically. It may make some particular product, repetitively, because it is so organized as to do this by virtue of this organization. But if the organization changes its pattern so as to deliver a different kind of product, a factor is introduced which may properly be called creative. Even a repetitive performance like that of some particular chemical reaction exhibits the property of transforming a pattern of material or energy into a different pattern, and this capacity is the source from which creativity, as here defined, is derived. Creation does not imply that something is made out of nothing. The scientific problem is to discover the laws in accordance with which these changes take place. Since the operating forces are manifestations of energy, it is evident that energy as such has creative efficiency. In other words, its activities are not stereotyped in rigidly predetermined patterns. These patterns are constantly changing by conversion as they interact with one another, and this capacity for change is responsible for cosmic and organic evolution and for the orderly processes of growth of living individuals. This perhaps is what Whitehead had in mind when he said, "creativity is ultimate"; that is to say, it is something which science cannot explain or analyze further.

This intrinsic creativity of physical processes is not a metaphysical speculation. It is an observed fact, and, if it were not so our cosmos would now be in a state of homogeneous equilibrium at the lowest level of organization. In view of these dynamic and creative properties of the physical universe, and of our incomplete knowledge of the laws in accordance with which the successive changes take place, we can set no limits to the kinds of products that natural mechanisms (physicalisms) can make. If now we wish to push further into the domain of psychophysics, account must be taken of this change in the climate of science which has come within the memory of men now living.

The modern mechanist is not a materialist in the classical sense. We grant that he deals only with physical structures and their operations. The operating body is always a mobile structure, which may be relatively stable as we see it in a mountain or a cat, or it may be a specific pattern of energy manifestation in which no particulate matter is recognizable, as in a ray of light. Usually it is a combination of both, as in a volcano or a thinking man. In current science by "mechanistic" we mean physicalistic, and these words now have meanings which are quite different from those of fifty years ago, although the latter are still current in both common speech and scientific literature.

Subsequent references to relativity and quantum mechanics do not carry the implication that the psychobiologist thinks that these principles, as now formulated in mathematical physics, are adequate to give a satisfactory explanation of the mind-body relationship. The most that can be claimed for them in this connection is that they may be steps toward the discovery of the still unknown principles that satisfy the requirements of the problem.

MY understanding of current scientific thought about some of the properties of the natural world has just been outlined. It is physicalistic throughout. Let us see now where the opposing psychologies mentioned at the beginning of this essay stand in the light of this evidence.

Many years ago I said[2] that introspection is as manifestly a biological method as is reflexology, and this principle needs re-emphasis today. Conscious experience influences conduct. It is therefore a factor of behavior. We may go further and say with Edwin G. Boring that a conscious experience is itself a behavior, a bodily act which may be observed introspectively just as we observe other kinds of behavior. Introspection, like the other methods of observation, is, of course, subject to the hazard of erroneous interpretation. And again it is timely to insist that the dualistic theories merely pile mystery upon mystery and only confuse the issues without explaining anything.

Because man is an animal and because his "spiritual" capacities are demonstrably vital processes, psychology is necessarily articulated with biology; but it does not follow from this that the laws of conscious experience are identical with those of the things of which we have experience. It is, in fact, clear that they are not. Each level of organization has its own distinctive properties, some of which cannot be reduced to those of lower levels.[3]

The mind-body problem will never be solved by ignoring the troublesome factors, either those of spirit or of matter. The inquiry cannot be limited to either the conscious or the unconscious factors, because what we are looking for is the relation between the two. It does no good to try to evade the issue as a "pseudo-problem." Traditional materialism (the "crude" variety) and classical spiritism (or, more reputably, "idealism") both involve neglect of a vast wealth of human experience, including common sense and refined scientific knowledge. We cannot choose between materialism and spiritualism. We must have both.

The attempts so far made to find a suitable formula of psychophysics have led into blind alleys. The chief difficulty arises from the fact that we have no common measure for objectively known dimensions and the relations observed in the process of knowing them. If ever a suitable formula for this relationship is discovered, it will probably be stated in some kind of relativistic terms, and it may dispense with numerical units altogether. Mathematics and symbolic logic are now developing methods of dealing with situations devoid of any quantitative factors, and this may point the way toward hitherto unexplored fields of inquiry in psychobiology.

[2]Herrick, C. J., "Introspection as a Biological Method," *Journal of Philosophy*, 1915, 12, 543-551.

[3]Herrick, C. J., "A Biological Survey of Integrative Levels," In R. W. Sellars et al (Eds.) *Philosophy for the Future*, Macmillan, N. Y., 1949, pp. 222-242.

The human brain controls many of the internal bodily activities and by far the larger part of overt behavior. Its structure is inconceivably complicated and much of the detail is still obscure. There is on record, however, a vast amount of knowledge about nervous structure and the laws of its operation. The products delivered by this mechanism are of many kinds, including growth of the structure itself, a variety of chemical reactions and associated changes in electrical potential, and the excitation of mass movements of the body. These have been thoroughly studied and described in physiological terms.

There is another unique property of some of these operations that cannot be studied by the objective methods of anatomy and physiology, because it is strictly private and can be recognized only subjectively by the person who is operating. Fortunately, we have a mechanism by which this personal awareness can be made public. Ideas can be translated into symbols—words and others—the utterance of which evokes similar symbols in other people. By this indirection subjective experience can be objectified and so communicated. This enables us to develop a legitimate science of introspective psychology. We do not know the mechanics of this process of symbolizing or the physical laws of its operation, but we have an interesting analogy in the electronic computing machines which perform similar operations with a quite different mechanism. Doubtless there are some common principles in these two kinds of operations.

There are no conscious factors, so far as we know, in most physiological operations; but we know as surely as we know anything in science that all mental acts are vital functions and we know where the organs are that perform them. We know also that the distinctively human types of higher mental functions are added to pre-existing physiological functions in the course of personal and evolutionary development.

Although we do not yet know how awareness emerges within the metabolism of brain tissue, we know that it does so and that it is as truly a physical process as is the transmission of light through apparently empty space. We do not know all about the mechanics of light either, but long ago Helios was banished from science because he could not explain anything.

When a weight is lifted by muscular action the cause of the movement is not a disembodied contractility. It is contracting muscle. When a problem in mental arithmetic is solved the operating agent is not a nonphysical mind which activates an inert structural mechanism. It is a living brain engaged in thinking. There is no specific kind of mental energy. Mental work is bodily work, and it is the body that gets tired when we do it. Mind does not move matter. It is "minding" matter that does "mental" work just as it is contracting muscle that does "physical" work. A thought is not a product made by a mechanism, the way bile is made by the liver. It is the operation of the mechanism, an act, not a material or any kind

of an object. *To split the function from the organ that performs it is scientifically as absurd as is the separation of the properties of any other thing from the object that manifests them.*

The claim of parapsychologists that psi phenomena in general involve "extrasensory perception," presumably through nonphysical agencies, calls for a critical appraisement of current studies of the mechanics of perception. This inquiry brings out very clearly the fundamental difference between the relations of space and time factors in the acquisition of perceptual knowledge of the objective world and these relations in the higher rational use of this knowledge.

Every perception of a physical object or event and every consciously controlled movement of the body involves a transactional relation of some sort between the "spiritual" and the "physical." In all these activities the conscious and the unconscious factors are inextricably interwoven. The first can be observed only introspectively, the other again introspectively but only by an indirection, by the observer becoming aware of some objective (unconscious) physical events. The act of perception involves the conversion of "physical" processes into "mental" processes, and conversely a voluntary act requires the conversion of a conscious purpose into movement of the physical body. The nub of the mind-body problem lies in the nature of these conversions.

The significant factors of such conversions can be isolated by experimental analysis more readily in the study of perception than of any other psychological process. We have biological evidence that the internal integrative and regulatory functions of an animal body must be sharply distinguished from the analytic functions of sensorimotor type which are concerned with the adjustment of the body to external things and events. The physical principles of integration are fundamentally different from those of the analytic functions, and some of the former can be described only in relativistic terms.

The most complicated integrative apparatus known is in the human brain, and the act of knowing is an integrative process which gives us two kinds of knowledge which Sellars[4] has called "perceptual knowledge" and "conceptual knowledge." The former gives us all the information we have about the spatial, temporal, and energic properties of the objective world. Newtonian mechanics was developed on the basis of this knowledge. This mechanics is of necessity framed in behavioral space and time. Conceptual knowledge comprises those higher rational and emotive functions which cannot be quantified in the numerical units of space, time, mass, and energy of Newtonian mechanics.

This distinction is fundamental. It is explained, in part at least, by the nature of the act of perception and of the apparatus employed. Its neglect accounts for the failure of the earlier attempts to find acceptable laws of psychophysics. This theme cannot be elaborated here. Enough has been done to show that this lead points to a promising field worthy of further investigation.

IN the light of this distinction between the integrative functions and the analytic functions of the animal body, the available knowledge of the actual operations of the body while it is doing mental work may be interpreted in a way that articulates man's spiritual life with his physiological life in scientifically acceptable terms. The most instructive observations in this field are based on the fact that all nervous action is accompanied by changes in electrical potential that can be localized and accurately measured. Using the same technique, a particular kind of mental work can be shown to be accompanied by similar changes in potential which are localized in specific regions of the body. The "brain waves" recorded by the oscillograph of thousands of conscious persons have been studied under a great variety of conditions, and the effects of various kinds of mental experience are clearly seen in this permanent record of the related changes in electrical potential. This is only one among many other methods which have been used to prove that we think with our bodies, and with different parts of the body for different kinds of thinking.

It is also clear that the higher levels of emotional drive and rational thinking are carried on by nervous mechanisms that differ radically from those of the lower level functions of stimulus-response type. There is much that is still obscure about both of these kinds of apparatus, but current research is yielding additional information so rapidly that it is justifiable to hope that the mechanics of thinking will ultimately be clarified.

We have been able here to mention only a few samples of the evidence which justifies the conviction that man's spiritual life, in the ordinary vernacular meaning of that term, is a real and significant component of his natural life. For the biologist this means that all mental acts of whatever kind are as truly vital processes as are nervous conduction and muscular movement. This gives us a unitary system of scientifically acceptable principles for everything within the range of human experience.

A man has native capacities for spiritual culture which set him at the highest level of integrative and creative efficiency yet reached in cosmic evolution so far as we know. This physicalistic conception of human nature, which has been accused of degrading the dignity of man and destroying his spiritual values, really points the way to the most efficient measures for enhancing these most precious human treasures. By setting the spiritual life in vital operational relationship with all other domains of science and of human endeavor, we get the benefit of all the resources of the sciences to reinforce and guide into appropriate channels the efforts of the other agencies of spiritual culture—education, philosophy, art, religion, and all the rest. This is a magnificent achievement.

[4]Sellars, R. W. "An Analytical Approach to the Mind-Body Problem," *Philosophical Review,* 1938, 47, 461-487.

STRUCTURALISM

Hilaire Hiler

Science Reflected in Art

STRUCTURALIST design, one of the forms of non-objective painting, represents the harmonious relations of structure and order. These are, however, presented in a new way, in the nature of a continuum. Relations of degree and those of geometric progression of color-form replace relations of simple analogy or in turn of contrast by opposition. As the sequential relations of structuralist design resemble those of natural growth, it may be termed "organic." In this sense it is like certain kinds of music. The word "harmonious" is used quite consciously in this context. It implies that the structuralist designer rejects the principle of "beauty in ugliness" which is upheld by so many contemporary painters.

Structuralism is an approach to design which is based on scientific method. Feeling is not ignored or neglected, nor is intellect looked on as incompatible with emotion. Its meaning is that the intelligence of the head may be utilized to accompany and to complete that of the heart. This outlook was held by most artists worthy of the name until the advent of Expressionism. Since that time, many a painting is said to have been prompted exclusively by feeling and uninhibited expression. The finished product was left in an unfinished state, and in the eyes of any other epoch it would have been looked upon as a rough preparatory sketch. Croce's exposition of the doctrines of Expressionism introduced a much needed freedom for experimentation in painting. But this acceptance also seems to have permitted license masquerading as liberty, and petty and pretentious graphic ambiguity in the name of creative art. In the words of the late Wassily Kandinsky, the world of fashionable modern art has long since been in a state of suffocating confusion.

The scientific method has been strikingly successful in imposing some sort of order on certain factors in our surroundings. The contemporary architect or designer employs the techniques of the engineer. Architects and interior decorators create surroundings which in their clean simplicity are characteristic of precision machinery, and only rarely does an expressionistic modern artist emerge in such surroundings. His creations are different and often in sharp contrast to a contemporary building and all that it houses, typical of careful design and execution in accordance with aesthetic measure and constructive laws of proportion. Only too frequently the modern painting is liable to be lacking in form, typically egocentric, eccentric and ignorant. Even where the applied design is mature in itself, functional and technically well executed and concluded, the accompanying or complementary paintings are often lacking in impact—emotional, visual or functional—technically inappropriate and without aesthetic meaning. Some critics excuse this on the grounds of the assumption of a wide division between the fine and the applied arts. Very often the public is less charitable. Along with the architects and designers in question, many of its members demand the clarity and organization of communication which are long overdue.

The art of collecting is an illustration of the scientific method. A collection must be limited; strictly defined and specified. As a whole, it must be orderly and consistent. In Structuralism, as far as form is concerned, this principle is applied through the elimination of all kinds of graphic forms except those of a purely geometrical nature. These forms are then classified and related, chiefly in terms of similarities and differences. Among certain other advantages—for design depends upon limitations—it offers consistency. It disposes of the disturbing contradictions of Cubism, for instance, where confusion is caused through the introduction of recognizable objects in a predominantly abstract configuration.

Structure differs from form. The structure of the human hand, for example, is capable of assuming many forms. It may be said that the forms used in Structuralism have now been methodically classified.

There is no limitation to form, but color has its limitations, and it is, therefore, easier to clarify. If pigments are looked on as raw materials or prepared as paints pure and simple, they are likely to misfire, whereas if colors are carefully and scientifically organized they can provide a ready-made instrument. To date, such an instrument has been little used by artists. In other words, color as opposed to form has a sound psychological and aesthetic structure. It remains for the artist to adapt this structure to his particular needs.

Here again, it is a question of fundamental similarities and differences, and of dyadic, triadic or, say, progressive relations—terms which will be familiar to mathematicians. Color-form relations are often established between groups.

The following are examples of levels of classifications:

HUES	bright clear colors
TINTS	light clear colors
SHADES	light, medium or dark dull colors
TONES	dark clear colors
"SCALES" OR RUNS	pastel, fog, smoke, twilight, night, etc.
ASSOCIATIVE PSYCHOLOGY	predominantly masculine, feminine
COLOR LEVELS	warm, cold, vegetative, electric, etc.
COLOR GROUPS	dark to light, bright to dull, warm to cool, etc.
COLOR FORMS (Principles of aesthetic measure)	assymmetrical balance or equilibrium, rhythm, proportion, repetition, subordination, accent, interruption, predominance, sequence, progression, contrast, enumeration, grouping, etc.

Structuralist design may be readily integrated with contemporary design in general. As C. K. Ogden has remarked, a game is quite a different activity from autonomous play. Play is a pastime for young children; a good game is for adults. Music, architecture and the conventional arts may be considered as games in the highest sense. The rules are imposed from without. It would seem that the outlook of contemporary philosophy and psychology justifies the structuralist outlook: the nervous system works as a whole. "Feeling" and "intellect" signify a separation in words but not in fact. The practice of art not only calls for the integrated, but for the integral man.

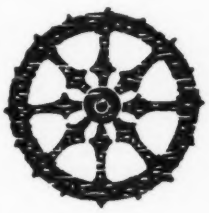
The premises of Structuralism touch upon the question of the present disassociation of western man. Integration is implicit in Structuralism. It begins with the integration of the mature professional artist-designer, but the implications go beyond this. Structuralism stands for the unification of art and science. To make this unification possible, it will be necessary for some contemporary artists to relinquish their insistence on "easel painting." They will then be free to work within the formulations of contemporary design, from a standpoint of scientific aesthetics, deserting "the world of modern art" for the wider world of design which has closer connections with the world of modern life.

The cover, and other colored illustration, are examples of Structuralism, both the work of Mr. Hiler.

THE RELATION OF CHRISTIANITY TO THE NON-CHRISTIAN RELIGIONS

Christian Evangelism Confronts a New World Situation

THERE is perhaps nothing which reflects more significantly the character of the world revolution we are now undergoing than the changing attitude of the Christian churches toward the non-Christian religions. Even so recently as twenty years ago, when Hocking's *Re-Thinking Missions* appeared, it was usual to regard adherents of the other great religions of the world as ignorant, idolatrous "heathen." Today, the rise of Asian independence, the emergent new states in Africa, and the contemporary resurgence of non-Christian faiths, require fundamental changes in such an attitude, if Christianity is to gain ground with non-Western peoples.



The spirit of nationalism which reflects itself in pride of race, of culture, and of religion today makes it impossible to assume an attitude of superiority or condescension without offense—if indeed such a thing were ever possible. The East is awakening to a sense of its own dignity, prestige, importance and power in the world, and this is inevitably accompanied by a mood of rejection of things and attitudes which have association with Western colonialism. As Toynbee has pointed out, Christianity has been identified with the West, and if it is to speak effectively to the East, it must be purged of its accidental Western accessories. Christian evangelism is beginning to acknowledge this fact and to seek other ways and attitudes. The uncompromising position assumed by missionaries of former days, that Christianity is an exclusive revelation from God, that this revelation was principally directed at Westerners, and therefore that it constituted a sort of Divine assent to their superior status in the world, could not be very appealing to their then subject peoples. It is one more sign of the times that Toynbee's criticisms of such a position are quoted freely in the *Sloane House News,*

published by the New York City Y.M.C.A.

Christian evangelism still has much study and soul-searching to do, but some indications of the directions this should take are beginning to emerge. The consultation held at Davos in Switzerland last July, under the joint auspices of the Departments of Evangelism and of Missionary Studies of the World Council of Churches, was "something of a new departure," to quote the report printed in its *Bulletin* No. 2, Division of Studies.

It was in one sense an outgrowth of former meetings at Jerusalem in 1928 and at Tambaram, Madras, in 1938, but it became quickly evident that although the problems raised previously had not been solved, the discussion would need to proceed on new terms in relation to situations vastly different from those envisaged at Tambaram. The consultation was a preliminary reconnaissance, but it raised enough issues, and offered enough material, in the words of the *Bulletin*, "for confrontation, for scientific study, for self-examination as well as the appreciation of the religions of others, which may—and indeed must —occupy the attention of the Christian churches, their ministers, missionaries and lay people 'on the frontiers,' for a very long time to come."

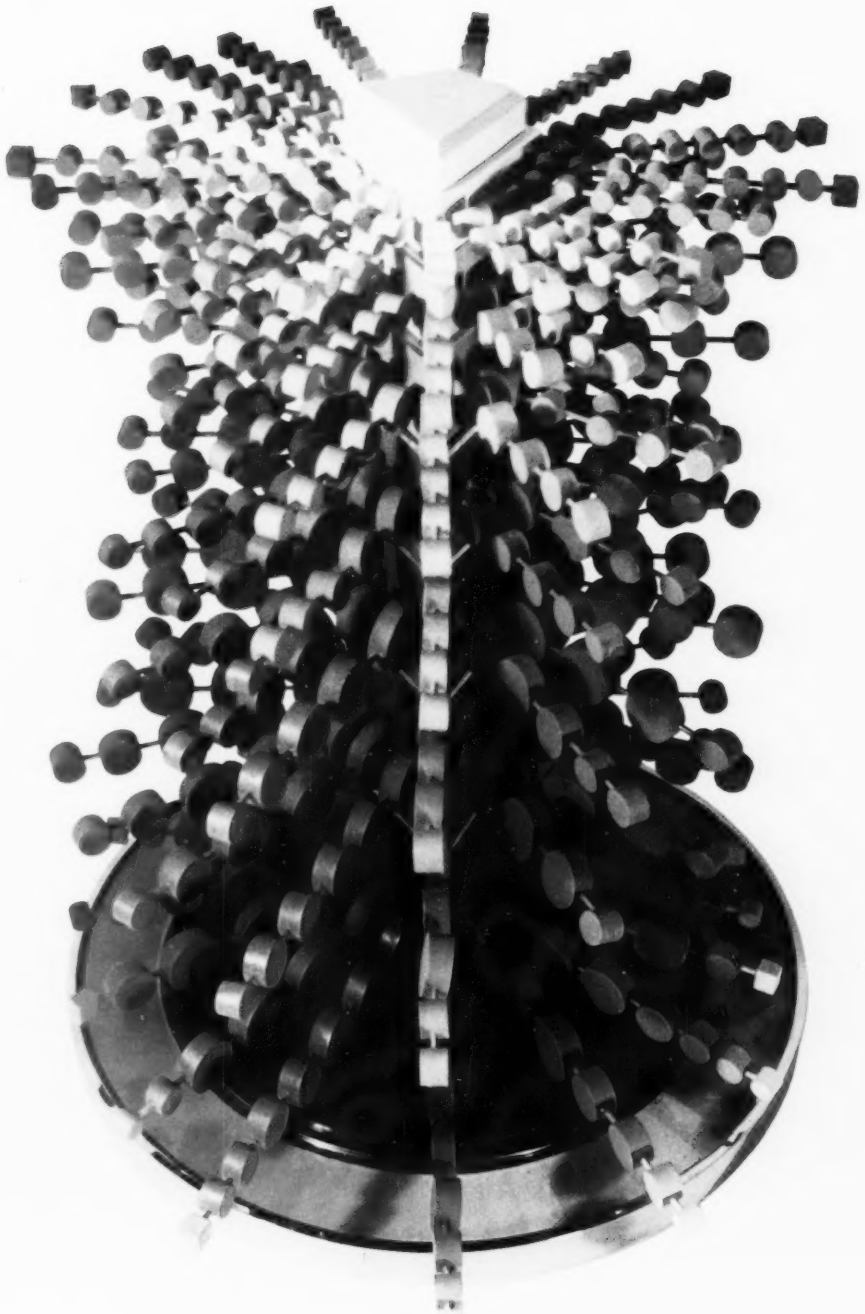
The debate at Tambaram served to bring into play a variety of views as to the relation of Christianity to the non-Christian religions, but positions were defined rather than reconciled. One of the features of the Davos meeting was a series of reports from many countries on new work and new developments, which appeared to indicate that some of the extremist positions taken at the Tambaram debate were tending to draw nearer together. According to the *Bulletin*, however, "there are still deep and wide divisions between individuals and groups regarding central theological affirmations within Christianity as well as the precise view to be held of the nature of non-Christian religions and of the Christian approach to them."

Something of the effect of post-war pressures was shown in the discussions, which also demonstrated that these pressures are neither simple nor uniform in their effects. Many factors must be considered: the political and spiritual vacuums which the old religions are expected to fill, the effect of communist doctrine on the older religions as well as on the Christian churches, and the extent and ways in which the religions themselves (or possibly the faith of those who profess them) have suffered radical change. One illustration of this change was given from West Africa, where the new intellectuals, Christian and non-Christian, seek to revive African cultural forms in response to the catastrophic changes, political, economic and spiritual, which their country is undergoing. The distinction between culture and religion is an elusive one, but the development is one which would hardly have been thought possible a generation ago; a revival of tribal religion may be possible, or a distinctively African form of Christianity, even of Islam, may emerge.

Many of the areas which were opened for discussion bear a rather specialist emphasis for the layman. However, the consultation indicates the beginnings of a wholly new program for the evangelistic and missionary outreach of the Christian churches. A major consultation on Christianity and non-Christian religion is planned, to be held before the next Assembly of the World Council of Churches in 1960.

All of this, however nebulous and tentative it may appear at first glance, is heartening to those who see hope for world peace in the strengthening of ties between the great world cultures. It is indeed true, as mentioned above, that the relationship between religion and culture is elusive, yet real. The orientation of a people toward the Whole, which manifests itself as religion, governs its physical and psychological expressions, be they political, economic or social. Thus in Burma and Ceylon, when the colonial imposition of Christianity lost its strength, the people themselves showed that they welcomed and respected the diversity of religious experience which Christianity could add to the traditions and insights of Buddhism. In fact, the coloration of political philosophy in Ceylon, the basis of government, is the deeply-felt allegiance to religion *per se*, in all its expressions. This is a lesson which the Christian churches, and indeed all the Christian world, needs badly to read, mark, learn and inwardly digest.

The illustrations shown are reprinted from the *Bulletin* # 2, Division of Studies, published by the World Council of Churches.



NEWS AND NOTES

THE 1956 Colloquium on the Nature of Man will be held on May 17th, 8:30 p.m., in the auditorium of The First Church in Boston.

The lecturer will be Dr. Gardner Murphy, Research Director of the Menninger Foundation, and his subject, "The Enigma of Human Nature." Dr. Abraham H. Maslow, Professor of Psychology, Brandeis University, will introduce the lecturer, and will act as Chairman for the discussion which will take place in the Hale Chapel after the lecture. The debate will be opened by Lawrence K. Frank, formerly Director of the Caroline Zachry Institute of Human Development, Dr. C. J. Ducasse, Professor of Philosophy at Brown University, and F. L. Kunz, Executive Vice-President of the Foundation for Integrated Education, followed by members of the Colloquium.

The Colloquium on the Nature of Man, Inc., is sponsored by the Dallas chapter of the Unitarian Laymen's League.

THE year of the first atomic bomb marked a turning point in the participation of scientists in public affairs. Many of the scientists involved in the development of the bomb suddenly began to realize its awful potentialities for destruction and its genuine danger to civilization. They also realized that they alone understood the nature of the creature they had spawned, and that it devolved upon them to enlighten the people before it was too late. One result was the founding of the *Bulletin of the Atomic Scientists*, which now enters its second decade of publishing, with the hands of the symbolic clock on its cover pointing to two minutes to midnight. In the January 1956 issue, Eugene Rabinowitch, Editor and one of its original founders, reviews the "first ten years," the ways in which the fateful discovery has changed the world, and the part which the *Bulletin* has played in the evolution of public opinion and national policy.

The founding of the *Bulletin of the Atomic Scientists* was perhaps a sign of the self-realization of the technological age, in which scientific knowledge has become so ingrained and fundamental to the structure of our civilization, and at the same time so specialized, that the previous convenient dichotomy between science and politics, between scientists who invent and diplomats who apply their inventions, between scientific thought and international policy, is no longer feasible. The *Bulletin* proposes to mark its tenth annivesary year by a series of symposia discussing the "changes in society brought about by the spectacular growth of science during these ten years." The discussion will range over such topics as Science and Religion, Science and World Politics, Science and the Prediction of the Future.

—*Ray W. Jackson*

"THE teacher is afraid of the principal, the principal is afraid of the superintendent, the superintendent is afraid of the board of education, the board of education is afraid of the parents, the parents are afraid of the kids—and the kids aren't afraid of anybody," according to *Look* magazine, quoting a former school teacher, Sam Levinson. To have freedom from fear, then, we need only turn the schools over to the kids.

True enough when we consider only freedom from fear. But there is also a much-neglected fifth freedom, freedom from ignorance. Under this heading the sequence must be reversed: the kids know less than their parents, who know less than the board . . . and so on to the teacher. Now if we could only make the schools safe for those teachers who possess some real knowledge—meaning, grasp of reality—then we would achieve freedom from ignorance and freedom from fear, by one single stroke.

First, of course, catch your teacher: the one having some real knowledge, in contrast with information, skills, attitudes, sound ability to add up the milk money, and gifted in putting on Johnny's rubbers, after having taught him to read.

—*F. L. K.*

OF what depth the manpower pool?

An interesting question has been going the rounds of late, directly raised by the problem which is facing the National Manpower Study Commission. It is, in effect, how many trained technicians must be graduated in one year to offset the loss to science during the last twelve months of just two: Albert Einstein and Enrico Fermi? This is a delicate problem of statistical analysis, involving intricate quantitative and qualitative calculations. In other words, to what power is it necessary to raise x number of run-of-the-mill technicians and engnineers, before they will equal $(1)y$ scientist of genius?

Many fascinating issues are raised, which may account, in part, for the greatly increased interest in studies of the nature of *creative* thought. They indicate that the Manpower Study Commission may need a little help in solving the problem.

Consciousness is Reintroduced into Psychology

AN attempt to put "consciousness" back into psychology is made by Dr. Joseph Nuttin of the University of Louvain in "Consciousness, Behavior, and Personality" appearing in the *Psychological Review*, Sept., 1955, vol. 62, pp. 349-355.

"The concept of consciousness still remains associated with one of the most traumatic experiences in the life history of scientific psychology, i.e., introspectionism. The wound has not yet healed; consciousness still means for many people a menace to behavioral science.

"Consciousness, now, is just what brings man in contact with the behavioral world. Contrary to what is generally believed, it should not be considered as necessarily related to introspectionism and the study of so-called 'states of consciousness.' "

Dr. Nuttin points out that there are trends in psychology today that emphasize the role of cognitive and perceptual functions in behavior. The danger in theorizing about perception is the possibility of using concepts adopted from introspectionist psychology. (The author is referring to a special type of introspectionism as promulgated by Titchener and which was quite limited in its approach as to what was not introspection.)

Dr. Nuttin is against the concept of the perceptual world being conceived as a "representation" *in* the subject of the world outside him. Instead, he defines it thus: "Perception is a *direct* contact with the outside world *itself*. . . No medium, no duplicate, no representation, is interposed between the subject and his world." The author recognizes that philosophy "raises the problem of a *reality* existing beyond the object of cognitive processes or independent of the observer." But he believes that from the behavioral viewpoint "man perceives the things themselves, that is, the world itself. Perception does not give him a *representation* of the world, but a direct *presence* of the world itself.

"Psychology is right in turning to the observable world itself in which man really behaves." Man's "openness" or exposure to outside things constitutes consciousness.

"The fundamental fact of exposure as such is what is meant by consciousness. Without the fundamental capacity of the organism to be open or exposed to an outside world, perceptual processes would be reduced to internal organismic changes. *Lack* of consciousness, therefore, means enclosedness in the realm of physical and biochemical interactions. Consciousness is psychophysiological activity underlying all psychological or behavioral processes, insofar as they are intrinsically directed toward objects. Even the so-called unconscious motivations and behavior patterns presuppose consciousness in this fundamental sense."

The problem of consciousness becomes complicated, however, by the fact that objects do not have to be presented externally. They can exist by means of what the author calls the *vicarious presence* of the object—images, concepts, and symbols. It enlarges enormously the world in which a man is living and leads to the process of "thinking" which is still directed toward dealing with the outside world.

Man also can treat himself as an object and such activity is called by the author "reflective consciousness," or consciousness raised to the second power. "Man's presence to himself enables him to look at himself and at the world from different points of view and to reshape at any time, to a certain extent, his own personality. It enables him to intervene, intentionally, in the course of his own development in order to restructure his relationships with the environment. This possibility seems to be implied in some phases of the therapeutic process . . . These 'higher' functions of consciousness also free man from specific forms of enclosedness."

In indicating the relationship between consciousness and the concept of personality, Dr. Nuttin mentions that psychologists as a rule "conceive of personality as an internal organization of traits, attitudes, aptitudes, and behavioral consistencies." He believes that such a definition leaves out the most essential characteristic of personality—that it is a "structure which goes beyond its internal organization . . . Personality is a way of being and behaving *in* a world that *exists for* the self . . . Personality signifies a specific modality of existence and of activity which is characterized by the fact of involvement in a situation or in the world. The fundamental personality structure is therefore an ego-world unity, and not an internal organization of an ego . . . Nothing could more profoundly mutilate the concept of personality than neglecting the aspect of exposure to the world which is an essential component of personality as such.

"Personality conceived in this way as an ego-world structure provides us with a sound basis for a theory of human motivation. Motivation theory today tends, so to speak, to situate and localize needs in the organism itself. But from the behavioral point of view, needs are to be conceived as basic patterns of organism-environment or ego-world relationships which actually are required for organism or personality functioning . . . Motivation must be looked at in relation to the fact that man lives in a meaningful world.

"Basic needs on the ego level are to be conceived as certain general and significant trends which eventually can be discovered in, and abstracted from this variety of ways in which the individual tries to insert himself in his world. Such a general trend might be

called 'need for self-realization,' as this 'significance' is discovered in, or abstracted from, the innumerable concrete forms of man's behavioral dealing with the world of his fellow men and life situations . . .

"The introduction of the notion of consciousness solves no concrete scientific problem regarding behavior, but it is necessary to appeal to the concept in order to formulate and to come to grips with the problems of behavior and of personality in a realistic fashion."

—W. M. Nicholson

The Problem of Evolution: Origin of the Human Brain

DR. Loren Eiseley, Professor of Anthropology at the University of Pennsylvania, has written a provocative reappraisal of the classic controversy between Charles Darwin and Alfred Russel Wallace over the evolutionary development of the human brain in the light of more recent evidence, including the exposure of the Piltdown skull forgery ("Fossil Man and Human Evolution," *Yearbook of Anthropology*, 1955).

"In the sixties of the last century," Dr. Eiseley writes, "two men examined the course of human prehistory, as it was then known, and proceeded to come to diametrically opposed conclusions. There would be nothing particularly remarkable about this observation except for one thing: both men had discovered the principle of Natural Selection independently and both were confirmed evolutionists. Their names were Charles Darwin and Alfred Russel Wallace . . .

"In their understandable eagerness to demonstrate the newly discovered principles governing the development of life, Darwin and his followers unconsciously minimized the distance stretching between man and his lowly cousins, the apes." The Darwinists did not hesitate to throw modern natives into the gap as representative "missing links" in the chain of human ascent. In addition, undue emphasis was placed upon the question of whether the brain of man resembled that of an ape physically, rather than upon what might be contained in the two dissimilar heads mentally.

This was "the key point which . . . arrayed Darwin and Wallace upon opposing platforms. In the Darwinian philosophy, Natural Selection was not a principle of self-growth. It could produce only a *relative* superiority sufficient to maintain a given species in active competition with its enemies or give it at best some slight advantage in the life-struggle. In a sense, therefore, it was a self-limiting principle. How, then, challenged . . . Wallace, did the human brain develop so far beyond what was necessary to secure the bodily safety and primitive needs of its possessor?"

Within the last year there has been wide-spread, sudden renewal of the century-old problem propounded by Wallace. This has occurred at a time when re-examination of the fossil remains of early man is proceeding apace in the wake of the discovery that the Piltdown skull represented a deliberate and unscrupulous hoax. For years the Piltdown forgery has been a source of confusion to scholars who were trying to estimate the length of time that modern man, with his large brain, had taken to emerge from the level of his prehuman ancestors. For some seventy years after the publication of *The Origin of Species* there were only two fossil human skulls which seemed to bear on the Darwin-Wallace question, one the Java Ape Man (Pithecanthropus), and the other the Piltdown or "dawn man." Both were originally thought to be roughly contemporaneous and very old (early Ice Age, about 1,000,000 years ago). But they implied completely unlike processes at work in the evolution of man, since Pithecanthropus was quite primitive and small-brained, while Piltdown, in spite of what seemed a primitive lower face, had a surprisingly modern, large brain. Which of these skulls gave a correct picture of human development? The Piltdown skull seemed to suggest that ages and ages of slow, Darwinian increase had produced a large brain.

"With the elimination of the Piltdown cranium as a valid fossil, a considerable reorganization of our thinking in regard to the nature of human evolution has become necessary. Nevertheless it is a reorganization which still involves the two persistent questions raised by Wallace in the eighteen-sixties: namely, How long did it take to turn an ape into a man? and secondly, By what means were the enormous powers of the human mind evolved?

"Pithecanthropus had long since been elevated to a position in the somewhat ill-defined Middle Pleistocene of Java and all of the later discovered big-browed, paleanthropic forms of man were apparently not greatly older, and some were much younger, than this . . . Were these creatures, or some group among them, the actual ancestors of man? Was true man, then, to be regarded as a very rapid emergent out of a lower Pleistocene array of ground-dwelling, bipedal apes? . . . If [this picture] is even approximately correct, it would appear to demand some other evolutionary mechanism beyond that of the old Darwinian struggle of man with man or group with group. The movement would appear much too fast. It has something about it of the nature of a quantum step . . . M. R. Chance and A. P. Mead say, 'No adequate explanation has been put forward . . . to account for the development of so large a cerebrum as that found in man.' . . .

"Considering these modernly expressed doubts of the experimental biologists, our re-examination of the terms of the human phylogeny in the light of the modern fossil evidence seems amply justified. Certainly the time appears past when simplistic assumptions about the competitive use of tools can be used to account for all aspects of the human mind. There is a sense of grinding inadequacy in this materialistic doc-

trine . . . The idea that all of the qualities which make man such a unique and remarkable creature could have been dismissed as a mere 'rattle in the machinery' of a creature evolved solely by the dextrous use of a flint ax is appalling, not because it was enunciated sixty years ago, but because it reappears in anthropological discussions even today . . .

"Biologists in general have avoided grappling with the question that troubled Wallace . . . As Etkin has pointed out, most writers start with at least a crude level of symbolic communication as *assumed*. The preadaptation or other explanation of the shift over from the purely *signal* communication of the animal to the linguistic activities of men is left unexplained for the simple reason that no one adequately has come to grips with the problem. It is the recognition of this fact which led to the renewed speculation in the year just past . . .

"Leonard Sillman pointed out not long ago that 'no other species [than man] comes into the world with so few fixed reactions for survival, knows less inherently how to maintain itself.' . . . Those who would disregard the higher mental characters of man, as side products of some kind of competitive struggle involving tools, have missed the real nature of the human transformation. It is this 'new' brain, denuded of precise instinctive responses, growing in a curious mighty spurt during the first few months after birth that has created man and set him off from his nearest relative. Evolution by infinitesimal competitive degrees which brings everyone out on the same potential intellectual level cannot be attributed to mechanical tool-using competition. Instead, it implies: (1) either a true orthogenetic trend in all men, or (2) some aspect of the environment which is selective and yet common to all men everywhere.

"This latter factor, if it is indeed the true explanation of the genetic mental equality of people all over the world, can only rest in the nature of man himself. In other words, the factor missed by Darwin and Wallace both, is the societal nature of human beings. The nineteenth century biologists were confused by man because they were so taken up with the struggle for existence in the animal world that they rarely glimpsed the fact that in the case of man there was a second invisible environmental world in which he existed and which replaced for him his lost instinctive adjustments. For the first time a creature had appeared in nature who created his own world in his head, but by communication and mutual similarity of mind made of many heads a little universe in which man existed apart from exterior nature. It was this societal universe, with its institutions supplanting his lost instincts, which directed his activities . . . The naked frail denuded creature . . . could not have survived alone.

". . . It should now be plain that the great basic innovation among all varieties of mankind was the production of the socio-cultural world itself. For this, man everywhere, whether in the far Arctic or the jungles of the Amazon, has been adapted unceasingly . . . The close equality of intellect seems to center around the ability of all men to use the one great socializing instrument: namely, language . . .

"The world of man is a flowing world of dreams and symbols which he created long ago and which will last as long as man is man. In no other world can he now live. But the key to the secret doorway by which he came into this world is still unknown. The fortunate thing in terms of modern anthropology is that we know the disparity between man and ape is great, not small. And in that disparity of mind is locked a mystery which will not be yielded up except by serious and profound analysis."

—*F. S. Woidich*

The *Yearbook of Anthropology*, 1955, was published by the Wenner-Gren Foundation for Anthropological Research, N. Y., ltd. ed., a large portion of which is being published by the University of Chicago Press under the title *Current Anthropology*.

The Integration of Science into Culture

THE December 1955 issue of *The Advancement of Science*, publication of the British Association, is devoted to addresses and reports given at the Association's fall 1955 meeting at Bristol. Of particular interest to readers of MAIN CURRENTS are two articles: "The Fragmentation of Science," opening address to the Association by its President, Ritchie Calder, and "The Educated Man in 1984," by J. Bronowski. (The Conference was reported generally in MAIN CURRENTS, Vol. 12, No. 3, January 1956, pp. 64-65.)

Both of these discussions emphasize the particular and pressing interest which scientists are taking in the integration of science into the whole fabric of society. This is not a new problem, but it seems to become daily more insistent, with fresh evidences on both sides of the Atlantic of the general misunderstanding and mistrust of science by the lay-public. Every week brings fresh efforts, also, on the part of scientists to persuade, convince, frighten or otherwise force the public to acknowledge that *science* is as indispensable to man as its effects are omnipresent in his life. The fact that these efforts are not always crowned with success has not gone unnoticed by the very men who are making them. As Mr. Calder says, the failure may be laid at many doors, since those who most influence the public mind are often so overwhelmed by their responsibilities to their specialty that they are little acquainted with that abstract entity called "science." Mr. Calder points out that "the trouble, twenty years ago, was not that the scientists could not explain. They could but they wouldn't. Today, I should say that they want to, but they can't."

The recurrent reason for this, of course, may be found in over-specialization and its jargon, and preoccupation with one's own job to the exclusion of everything else. This has not always been the spirit of science or scientists, as Mr. Calder shows by describing the activities of the Lunar Society, whose mem-

bers, numbering only twelve, all scientists, discussed everything from poetry and the arts to religion and politics and exerted a tremendous influence upon political philosophy and indeed upon the Constitution of the United States through one of its authors, Thomas Jefferson. The fact that science affected politics even in what we now consider to have been a non-scientific age has been attested by Woodrow Wilson, who pointed out that the Constitution was based on a theory of political dynamics "which was a sort of unconscious copy of the Newtonian theory of the universe." Mr. Calder emphasizes even more strongly that "science today *is* politics—world politics, not party politics. It dominated, whatever the items on the agenda, the discussions of the Big Four at Geneva . . . Science cannot divorce itself from politics any more than it can from economics, because it is the integral force of both." For this reason, the fragmentation of science which we witness today is dangerous: "Because science is segregating itself into more and more compartments, . . . because in the process it is becoming less and less intelligible, and because in its diversity it is producing diverse results, it is creating and exacerbating the social stresses of our times."

When society has at its disposal such products of science as the atomic bomb, judgments as to its use can only come from an informed public, and only those who know the full implications can inform the public. "What the public is beginning to realize is that the scientists know that they (the scientists) do not know . . . While the physicists may know a great deal about the explosive forces . . . they are certainly out of step with the biologists, who certainly do not know what the biological 'chain-reaction' will be. This divergence . . . can mean the destruction of the human race." Mr. Calder further refers to Dr. Oppenheimer's experience as a case in point where the dichotomy between science and public policy led to his vulnerability, and suggests that this could not have occurred had science not been made into a mystery to be revered but not understood by the public.

As always, it is easier to define the problem than to suggest its cure. (In this connection, may it be said that the Foundation for Integrated Education has been pursuing the *solution* since its inception. But to state it non-technically and in a manner which will engage the interested enthusiasm of the general public is a task which must, unfortunately, come *after* it has received the assent of science. First, the universals which knit sciences together must be established; then perhaps they can be expressed in some median language which may become acceptable to scientists and intelligible to laymen. In the meantime, however, as this article emphasizes, too few scientists are aware of, much less concerned about, the problem.) However, Mr. Calder offers the spirit of universal inquiry as one means of establishing a common ground. Efforts to create a proper understanding of the methods and processes of science and of their social integration would help to eliminate the atmosphere of mystery which the apparent haphazardness of discovery has engendered. And of course, more and better attention to the teaching of science in school and university to future members of the general public will do much to create an enlightened and informed public opinion when those members come of age.

This point leads directly into the subject of J. Bronowski's address, "The Educated Man in 1984," the title of which was suggested by J. F. Wolfenden's article, "The Educated Man in 1955." (See MAIN CURRENTS, Vol. 12, No. 2, November 1955, p. 43.)

Dr. Bronowski strongly supports Mr. Calder as to the importance of incorporating the spirit and meaning of science if we are to achieve a balanced and unified culture. In his view this is to be accomplished through education, and particularly through the teaching of science not as a vocation, but rather as a necessary part of the cultural experience. To illustrate he quotes the learning of Italian by a scientist in order to read papers in mathematics, as contrasted with the same study by a retired teacher of mathematics, in order to read Dante in the original. The first is vocational education; the purpose of the student in the second is "not to make a living but to live, and to take not merely his place but his share in human society." The article contends that because science is not today taught in the schools nor appreciated in the streets in this spirit, "our society is indeed divided between the past and the future . . . My subject is science as a part of culture, and a scientific education as part of our cultural education, because for lack of these life-giving parts the ancient cultures are dying from the roots."

To those who feel that science is nothing but a body of facts and therefore can contribute little to culture, the author emphasizes that this mistaken view ignores the real nature of science, which is "a way of giving order, and therefore of giving unity and intelligibility, to the facts of nature." But whatever culture may be, the means by which it is conveyed are always precise. If reading, arithmetic and language were first taught merely as useful skills, they have long since developed into a wider range of usefulness, needful to all men, no matter what their profession. The same should be true of our education in science, for it now enters the lives of everyone. But this is just what is lacking; whereas every person of education has implicit knowledge of history, literature and language, our culture does not embody and deliver the tradition of science in the same general way.

In order to correct this situation, the author believes that we must start in the schools, and he makes the following recommendations: First, that mathematics of a more practical kind be taught, as a living language, and that it should include knowledge of the statistical method of science, and of relations of order and arrangement. Second, that atomic studies should begin much earlier in the teaching of physics and chemistry than is now the case. Third, that greater emphasis should be given the teaching of biology;

fourth, that science should be taught as an evolution of knowledge; and fifth, that undergraduates should be encouraged to undertake personal scientific research, so that non-scientists may have some direct participation in the methods of science.

Dr. Bronowski strongly urges that by these and other means every effort be made to incorporate science as a culturally integrated subject. Otherwise, he fears the dominance of science will make scientists something of a race apart, and of necessity, a superior and powerful one. The educated man in 1984 will speak the language of science, but he must not speak it alone, nor must he be allowed as a specialist to run the world for the ignorant, for that would be a slave world, a betrayal of democracy. The only way to head off such a disaster is to make the educated man universal in 1984, "to make the language of science part of the education, the cultural education, of the young who will have either to make or to suffer 1984."

—E. B. Sellon

MAGNETOHYDRODYNAMICS is a subject of growing importance in physics. It has to do with the motion of electrically conducting fluids, where, added to the "hydrodynamics" of the fluid motion, are added the complications of forces due to the presence of magnetic fields and induced electric currents in the moving fluid masses. Investigations, theoretical and experimental, in this field have application to such diverse subjects as the earth's magnetic field (on the hypothesis of a molten core), motion of finely divided matter in space (including theories for the origin of cosmic rays), theories of the atomic nucleus and the elementary particles, and simple flowmeters. The *Proceedings of the Royal Society,* Series A, 29 December, 1955, is devoted to a symposium which was held on the subject in May, 1955. The papers presented are rather abstruse and specialized for the general reader, but a useful review and introduction is given by Sir Edward Bullard, of the National Physical Laboratory, who led the discussion.

—Ray W. Jackson

REVIEWS

Emotional Factors in Cancer

THE *Psychological Variables in Human Cancer* is the subject under discussion in a Symposium edited by Joseph Gengerelli and Frank J. Kirkner (University of California Press, 1954, 135 pp.).

The past twenty-five years have seen the growth and popularization of the concept that emotional forces play an important role in the functioning of the physical body in health and disease, indeed, that they may represent the most important single factor in a number of difficult conditions such as peptic ulcer, mucous colitis, asthma, essential hypertension, etc. The familiar word, "psychosomatic," threatens to become one of the soothing formulae, like the "virus," with which busy physicians reassure themselves that they know precisely what is wrong with a patient when, in fact, they do not.

Not all physicians are equally impressed by the psychosomatic concept, of course, and some, notably among the surgical confraternity, accord it little causative importance in the conditions with which they are called upon to deal. Principal among the diseases in which the emotions have been presumed to play little or no role is cancer. As one of the participants in the symposium, Dr. Philip West, remarked of his original attitude on this problem: "This is one disease that is purely organic and belongs forever and exclusively in the realm of the surgeon, the radiologist, the pathologist and the autopsy room. Moreover, I was positive that here was a disease that could be depended upon; they all died, surely, routinely, and inevitably, with no exceptions to the rule."

It had become evident in recent years, however, that this fatalistic attitude about cancer was not in complete accord with the facts witnessed by the surgeon and the pathologist. A very small number of cases of advanced cancer in which the diagnosis was established by the best criteria of the clinic and the pathological laboratory have been reported as regressing "spontaneously," without any treatment, and remaining quiescent or disappearing completely. In some of these cases five-year follow-up studies have confirmed the permanence of these recoveries.

Other laboratory studies suggest similar phenomena, somewhat less dramatic to the non-professional observer, may occur on a wide scale. Autopsy studies of males dying of miscellaneous causes have revealed that from 20% to 46% had cancer of the prostate. It would appear that most of these cancers had remained stationary or regressed and the individuals had lived a normal life span despite the fact that they had cancer for twenty or thirty years. Mass surveys of women for the detection of early cancer of the uterine cervix have revealed essentially the same situation. A large group of women in whom beginning cancer was detected by the Papanicolau technique and later confirmed by more accurate

methods was followed, and in only about 20% of these did the tumors grow and require treatment. In the remainder they receded and disappeared.

Thus we are faced with the ". . . startling possibility that any cancer which becomes grossly evident, spreads throughout the organism, disrupts its normal physiology and finally kills, may actually be the exception." Possibly all of us may have had, have, or will have some form of cancer, but because of the favorable balance of forces in our bodies which keep in check these degenerative tendencies, we will never know it and probably die of unrelated causes.

The crux of the problem, therefore, is precisely this balance of forces in the total organism which regulates the functioning of the body down to the behavior of every last cell in every organ and tissue. What are these forces? How are they organized? How do they become unbalanced? How can they be brought back into balance? These are some of the fundamental questions which must be much more fully answered before medicine can claim to be a science.

The proceedings of the symposium on the psychological variables in cancer suggest that among the forces which influence the course and outcome of human cancer the emotions and attitudes of the patient must now be accorded a place.

The studies which formed the basis for discussion during the symposium were not concerned with the emotions as a primary *cause* of cancerous degeneration. The main purpose was to determine whether or not the emotions can modify the course of the disease in cancer patients. The method used was to make an empirical comparison between a group of patients with fast-growing cancer and one with slow-growing cancer. Psychological data derived from a study of eighteen cases (six "fast-growing" and twelve "slow-growing") were analyzed, and the hypotheses derived were tested on a second group of thirty-two cases (nineteen "fast" and thirteen "slow"). The fifty subjects were for the most part male patients from the Neoplastic Disease Service of the Veterans Administration Hospital, Long Beach, California.

Care was taken to select cases which were in comparable condition medically with the exception of the rates at which their tumors were growing compared to the average for those types of tumors. The psychological tests given each patient included the Minnesota Multiphasic Personality Inventory and the Wechsler-Bellevue (Rorschach studies on twenty out of the fifty cases in general corroborated the MMPI findings). An attempt was made to avoid the error of obtaining psychological data from patients who were under stress due to treatment or a downswing in their illness. The patients were tested in periods of comparatively good health during remission and none were bed-patients.

Certain statistically significant differences were found between the "slow" and the "fast" groups. Characteristic of the "fast" cases were ". . . greater defensiveness, more anxiety, and less ability to release tensions through motor discharge, either verbal or physical, when compared to the "slow" cases. It was suggested that ". . . the patient with a fast growing cancer tends to be a person with an overly defensive attitude about his personal and social adequacy." The fast patient also tends to speak of himself as "easily awakened, brooding, feeling useless, poorer in judgment, lacking energy, etc."

In an interesting chapter on Autonomic Functions in Neoplastic Diseases one of the participants in the symposium presents data suggesting that the balance between the sympathetic and parasympathetic nervous systems (which regulate the automatic functions of the body, such as digestion, circulation, etc.) may be measurably disturbed in the "fast" group as opposed to the "slow" one (which appears closer to the normal pattern).

One of the valuable aspects of this short volume is that it brings together between two covers a number of suggestive observations on the tumor problem which were scattered in the literature or had not found their way into print. The effect, for instance, of mental illness on the incidence and progression of cancer is summarized. A number of studies has shown that in the institutionalized psychotic population the incidence of cancer in schizophrenics is about half that of the general population and occurs at a later age. Paranoid patients, those who are suspicious, fearful, and hostile to a marked degree, have, however, an incidence of cancer four times greater than the general population and the cancers begin earlier and grow uncontrollably.

While these studies represent only a beginning, they would appear to be a valuable stimulus to more extensive work. It is to be hoped that this will be forthcoming without delay. Meanwhile this volume represents a useful summary of our knowledge of this challenging problem up to 1954.

—F. S. Woidich

Encouragement in the Search for Meaning

THAT a serious need, long neglected in psychotherapy, is now receiving close attention from men of first rank is known to us from readers of MAIN CURRENTS who are high in the psychological profession. Victor E. Frankl, an M.D., has now provided a well-rounded discussion of logotherapy for laymen and for professional psychotherapists: *The Doctor and the Soul,* An Introduction to Logotherapy (Alfred A. Knopf, New York, 1955, 280 pages, $4.00).

Briefly, logotherapy is intended to aid those whose ills are derived from the all too prevalent doubt that individual human life has meaning. Dr. Frankl does not supply a philosophy which restores such meaning where it has been lost, nor furnish it where it has never been possessed, and no one should expect him to do so. For the deficiencies in knowledge which deny our society a rational-spiritual philosophy of life are so many and so great that they not only induce confusion, defeat, and neurotic disorders among many, but have brought about a stoic settled despair among very many more in higher education, men who should still be seeking. We are as the Roman of the late Republic, abandoned between those tough-minded people (on the one side) who are prepared to live with ignorance about the meaning of life and to encourage belligerence and reliance upon war and violence, and those weak and venally minded people (on the other) who are, in effect, epicureans, and would lead us on with visions of fine food, wonderful automobiles, and sensate satisfactions generally, to

the doom that inevitably attends societies which prate about the spirit and deny it. The logotherapists are pursuing, as best they can without the help they deserve to have from scientists and scholars, the ancient and noble thesis that between religion, as an affective mood derived from the greater Whole, and life, as it is lived, there lies a rational connection, and that the promise in this connection—the seeking it, even though we do not yet have it—should be used to encourage people to live courageously.

The term logotherapy is derived from the *Logos* doctrine, to which the opening words of the Gospel according to Saint John refer. By logos we may understand "collective intelligence," the word itself deriving from λέγειν, to collect. The assumption is that human reason is an important aspect of reality. This resource, conceptual knowing, is as clearly expressed in man and his works—and as much sets him off from the rest of nature—as the other two great classes of familiar phenomena, those of energy and matter and those of life and functional form, are different from his essential nature and from one another. Terms comparable to *Logos* are *Elohim* in the Hebrew, *Iswara* in the early Hindu, and *Brahmā* in the late Vedic systems of language and thought. Unfortunately the history of the religions records the neglect and finally the rejection of the inherited structuring of thought which incorporates man into that category, the collective intelligence, and hence came the failure to sustain in modern mankind confidence that life is and can be seen—and not merely believed—to be meaningful. Our reliance must perforce be upon a proper interpretation of the riches of modern science.

Dr. Frankl does not make clear how, in fact, this restoration of insight is to be accomplished, as a social change; I repeat, we need not expect this of him, single-handed. He is concerned with inducing in his patients a sense of self-responsibility, of confidence, that the striving is somehow worthwhile. And this is much, a partial corrective for the emphasis upon mere emotional relief through analysis, and much better than the reduction to animalism, seen in neo-Freudianism. It should be consonant with the new orientation to that supra-rational (yet intelligible) wholeness of nature and man aimed at by the methods of C. G. Jung, but not worked upon systematically, in any proper degree, by even that school, so far as we can see in the re-issuing of Jung's works, and collateral studies, by the Bollingen Foundation, which continues to offer us re-made mythology without resting the studies upon solid physical science methodology.

Looking to the future, however, it is fair to assert that his own doctrine demands of Dr. Frankl and his colleagues that they engage in specific activities which will develop a modern and acceptable re-interpretation of the universe, so that the ignorant mind can not only be encouraged to work and to search, but also be supplied with healthful intellectual substance, out of which a meaningful universe and a meaningfulness for life can be gradually built up.

One of our problems is that of seeing that there is a deeper cultural potential, and that there are definite basic needs and nourishments for the mind, just as there are for the body. What kind of a diet would it be that did not feature protein, liquids, fresh air and the like for physical metabolism? Similarly there must be a basic diet of reason that can be clearly characterized for the mind. We are not referring to ill-articulated general aspirations. Modern man needs a meaningful cosmology, and a psychology that ranges him in this cosmos, in which he is a part of its intelligence. In the volume here under notice, the emphasis is upon existentialism. But where, we ask, behind the existentialist's instant present do we find the Eternal Now? We need this if we are to define self-responsibility. What is the reasoned structure of nature of which we are a part, and to which we are—by our very natures, as intelligences—responsible? We cannot get answers from shopping around among existentialists, instrumentalists, operationalists, contemporary though they be, for they are all, in the end, speculative or specialist systems. We need to know from education those working principles of reality which give the present moment, and evolution, past and present, their real meaning for man.

—*F. L. Kunz*

A Scientist Discusses the Implications of Science

THE Open Mind, by J. Robert Oppenheimer (Simon & Schuster, New York, 146 pp., $2.75) is two books in one. Consisting of eight lectures dating from May, 1946 (less than a year after the first atom bomb) to December, 1954, four chapters "deal with atomic weapons and some related questions of policy." Here is authoritative material on a vital matter to us all, given by a man who was instrumental in giving us the bomb —and the problem. The other four deal with the fundamental problem of our society: "science as an intellectual activity and the wider culture of our times."

Of the first part of the book, this reviewer can say only that it is a sober and authoritative but non-technical summary of the complex problems and readjustments which the dawn of the atomic age necessitates.

Whether he be discussing "Physics in the Contemporary World," "The Encouragement of Science," "The Scientist in Society," or "Prospects in the Arts and Sciences" (the titles of the last four chapters), Dr. Oppenheimer speaks sensitively of the ideals, standards, and openness of mind which are implicit in the scientific method. He makes many pointed remarks about tyranny, dogmatism, and authoritarianism. These, he reminds us, were not congenial to the beliefs of the founders of our country. To restrict science, to close minds, to continue to view science as something special and apart from the rest of human endeavor, to permit large numbers of men to remain in ignorance of science—all these will tend to solve our present problems by destroying the very roots of human society. For societies cannot survive as closed systems, and systems can remain open only as minds are open.

"Perhaps *the* indispensable element in giving meaning to the dignity of man, and in making possible the taking of decision on the basis of honest conviction," says Dr. Oppenheimer, "is the openness of men's minds, the openness of whatever media there are for communion between men, free of restraint, free of repression, and free even of that most pervasive of all restraints, that of status and hierarchy."

—*Harvey W. Culp*